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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,511	01/15/2004	Hans W. Bruesselbach	B-4759NP 621649-7	7055

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LADAS & PARRY
5670 WILSHIRE BOULEVARD, SUITE 2100
LOS ANGELES, CA 90036-5679

EXAMINER	
PEACE, RHONDA S	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 07/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/759,511	BRUESSELBACH ET AL.	
	Examiner	Art Unit	
	Rhonda S. Peace	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 July 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *See Continuation Sheet*.

Continuation of Attachment(s) 6). Other: Affidavit Pursuant to 37 CFR 1.104(d)(2).

DETAILED ACTION

Introduction

This office action is responsive to the applicant's communication filed on 7/5/2005. At that time, the applicant amended claims 1 and 11, adding the limitation "the second end of the fibers are detached from each other." In addition, the applicant also added claim 27, which recites the limitations within the original claim 1 and adding the fibers are silica fibers, and claim 28, which recites the limitations expressed originally in claim 9 where the phrase "uniformly stretched" has been replaced by simply "stretch." The examiner has carefully considered the arguments set forth by the applicant in the 7/5/2005 communication, and has concurred with the applicant that the above-described limitations added to the claims on 7/5/2005 are not disclosed by Harootian (US 5303373) as they apply to claims 1-19. In response, the examiner has set forth a new rejection of claims 1-19 below. As well, the examiner has set forth rejections for claims 20-28, which are described below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4, 5, 8-11, 14, 17, 18, 19, 27 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Russell et al (US Patent 4932747).

As to Claims 1 and 27, Russell et al teaches a plurality of optical fibers **15** (column 3 lines 63-67, Figure 3), each having a first **15b** and second **15a** end, whereby the fibers are bundled, fused, and tapered proximate the first end **15b**, and providing a facet normal to the length of the fibers, formed by means of cutting, polishing, or any similar method (column 4 lines 67-68 and column 5 lines 1-3, column 5 lines 8-16, Figure 3), and wherein the second end **15a** of the fibers are detached from each other (column 4 lines 46-51, Figure 3). Glass fibers may be used as the fibers within the bundle (column 4 lines 6-18).

As to Claim 4, Russell et al shows the device as described above, wherein Figure 3 clearly illustrates the core diameter of each optical fiber in the tapered region **15b** is smaller than the core diameter of each optical fiber in the non-tapered region **15a**.

As to Claims 9 and 28, Russell et al, in addition to the teachings above involving claim 1, shows the said device where the fibers comprising the fused section are stretched to provide a desired amount of coupling between the individual fibers (column 6 lines 32-35). It is inherent that varying amounts of stretch will physically correspond with varied degrees of coupling, as described in the attached Affidavit pursuant to 37 C.F.R. 1.104(d)(2) in support of the above assertion made by the examiner, as requested by the applicant.

As to Claims 5 and 14, Russell et al teaches the claimed device of where each optical fiber **15** is adapted to receive input signals adjacent the second end **15'** and emit

the signals as a combined output at the facet adjacent the second end of the fiber **15"** (column 7 lines 12-17, Figure 5).

As to Claims 8 and 17, Russell et al teaches the device as described above, wherein the diameter of the optical input at the unfused end **15a** of the given optical fiber is larger than the diameter of the same optical input at the fused end **15b** of the given optical fiber, due to the tapering process. Also note that Russell et al specifically states that the device may be fashioned into a number of sizes and shapes, and would include the arrangement where the optical input at the unfused end of the given optical fiber is larger than the diameter of the same optical input at the fused end of the given optical fiber (column 5 lines 8-16, Figure 3).

As to Claim 10, Russell et al teaches the device of claim 1 wherein at least one optical fiber has a different core size from at least one other optical fiber (column 4 lines 21-25).

As to Claim 11, Russell et al teaches a method of coupling light using a plurality of optical fibers **15**, each having a first **15b** and second **15a** end (column 5 lines 19-30, Figures 3 and 4), wherein the fibers are fused together proximate the first end **15b** and tapered such that the core fiber diameters at the tapered end **15b** of the bundle are smaller than core fiber diameters at the untapered **15a** end of the bundle (column 5 lines 30-36, Figures 3 and 4). In addition, Russell et al shows a facet formed by cleaving the fiber in any desired manner (column 5 lines 34-42, Figures 3 and 4), as well as illuminating the facet with light (column 5 lines 22-26). In addition, the second

ends **15a** of the fibers **15** are left detached, or independent, from one another during the fusing process (column 4 lines 46-51, Figure 3).

Claims 18 and 19 are anticipated by the teachings of Russell et al which describe a method where the fibers comprising the fused section are stretched to provide a desired amount of coupling between the individual fibers (column 6 lines 32-35). It is inherent that different amounts of stretch result in different degrees of coupling between fibers, as described in the attached Affidavit pursuant to 37 C.F.R. 1.104(d)(2) in support of the above assertion made by the examiner, as requested by the applicant. As well, Russell et al discloses a method wherein at least one optical fiber has a different core size from at least one other optical fiber (column 4 lines 21-25).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 2 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US Patent 4932747) as applied to claims 1 and 11 above, and further in view of Basavanhally et al (US Patent 6827500).

Pertaining to claims 2 and 13, Russell et al teaches the device and method as described above. While Russell et al suggests using any desired array shape (column 2 lines 43-51), it is not directly suggested that hexagonal, square, and three-nearest neighbor packed arrays can be used. Basavanhally et al teaches a plurality of optical fibers that are arranged in a hexagonal close packed array (figure 1; column 2 lines 11-15). The use of the teachings of Basavanhally et al with the device described above by Russell et al would have been obvious to a person of ordinary skill in the art, as the hexagonal array described by Basavanhally et al minimizes unused space within the optical fiber bundle. While it is observed Russell et al describes the fiber bundle as being closely packed in any desired array, this does not exclude the application of the teachings of Basavanhally et al to the device of Russell et al. Certainly the overall teaching supplied by Basavanhally et al shows the formation of arrays showing a hexagonal shape, and while the actual scaled device of Russell et al may not couple directly with the actual scaled array of Basavanhally et al, the teachings remain applicable, namely showing arrays of differing geometries for optical fiber bundles are possible using arrays.

Claims 3 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US Patent 4932747) in further view of Smith et al (US Patent 5045100).

Regarding claims 3 and 12, Russell et al teaches the use of an optical array of a predetermined format (column 2 lines 45-51). However, Russell et al does not disclose the specific use of a glass matrix to contain the optical fibers of the device. Smith et al discloses the use of a glass matrix for arrangement of optical fibers within a bundle (column 2 lines 51-55; column 1 lines 35-51). To one of ordinary skill in the art, it would have been obvious to couple the teachings of Russell et al and Smith et al, for the purpose of uniformity. The use of a glass matrix is beneficial as it provides material continuity between all elements of the optical fiber bundle, ensuring the optical fibers will behave in an appropriate manner. Using dissimilar materials in the construction of the fiber bundle increase the possibility of structural instability and behavior malfunction during the fusing, tapering, and stretching process. Since glass is a common material in fiber construction, it would be obvious to one skilled in the art to use glass as the material for matrix construction for the reason stated.

Claims 7 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US Patent 4932747) in view of Smith et al (US Patent 5045100) and further in view of Anthon et al (US Patent 6411762).

Speaking to claims 7 and 16, Russell et al discloses the device, as further viewed by Smith et al, as discussed above. Neither Russell et al nor Smith et al discloses the use of a glass matrix comprised of fluorosilicate. Anthon et al discloses the use of a

fluorosilicate glass matrix in the formation of optical fiber bundles (column 13 lines 1-16; Figure A). Fluorosilicate offers a low refractive index doping agent, minimizing any light that may be passed from one optical fiber within the bundle to another. For this reason, it would have been obvious to one skilled in the art to use fluorosilicate as the specific glass matrix material.

Claims 6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US Patent 4932747) in further view of Harootian (US 5303373).

As to Claims 6 and 15, Russell et al discloses the device, as described above. Russell et al does not disclose multi-directional qualities of the device, meaning that it is able to receive an input at the facet and be emitted as a plurality of signals from the unfused ends of the fibers. Harootian shows a multiple fiber bundle which is tapered along its length and cleaved proximate the fused end, where the ends are coupled to two imaging devices, the nature of which is uncritical (column 4 lines 17-24; figure 1). Therefore it is possible that an input is delivered to the facet of the fused portion of the bundle and distributed to each optical fiber within the bundle. It would have been obvious to one of ordinary skill in the art to combine the teachings of Harootian and Russell et al to extract the teaching that tapered optical fiber bundles may be adapted to allow the facet to accept input signals and thereby adapt the opposite, untapered end to act as an output for optical signals.

Claims 20, 23, 25, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US Patent 5303373).

Addressing claim 20, Harootian discloses a plurality of optical fibers, each having a first and second end, whereby the fibers are bundled, fused, and tapered along their length, and providing a facet normal to the length of the fibers (column 2 lines 27-37), formed by means of cutting, polishing, or any similar method. (column 5 lines 41-43). Also, Harootian teaches the claimed device of where all individual optical fibers fit precisely from one side of the corresponding imaging device to the other side of the bundle (column 3 lines 3-11, 28-33). It would have been obvious to one skilled in the art that Harootian suggests a device that emits a plurality of pixels that correspond to individual fibers, this plurality of pixels then emitted as a single output from the device facet. As well, Harootian shows the device, wherein the diameter of the optical input at the fused end of the given optical fiber is smaller than the diameter of the same optical input at the unfused end of the given optical fiber (column 3 lines 34-43; column 2 lines 22-26). In addition, Harootian explains this device is designed to couple two imaging devices, the nature of which is uncritical (column 4 lines 17-24; figure 1). It would have been obvious to one skilled in the art that devices wherein a single optical input is delivered to the facet of the fused portion of the bundle and distributed to each optical fiber within the bundle may be used with the fused fiber bundle to allow the facet to receive a single optical input traveling in free space wherein this single input is distributed amongst all optical fibers within the bundle. This being said, either end of the device as described by Harootian may be considered an optical input, and therefore,

one can also say that the diameter of the optical input proximate the fused end of the given optical fiber (as the entire bundle is fused) is larger than the diameter of the same optical input at the opposite end of the given optical fiber (column 3 lines 34-43; column 2 lines 22-26).

As to claim 23, Harootian shows the device of claim 20 wherein the core diameter of each optical fiber in the tapered region is smaller than the core diameter of each optical fiber in the non-tapered region (column 2 lines 27-37).

As to Claim 25, Harootian shows the said device where the fibers comprising the fused section are uniformly stretched to provide a desired amount of coupling between the individual fibers (column 2 lines 38-56; column 6 lines 50-58). It is inherent that different amounts of stretch result in different degrees of coupling between fibers.

As to Claim 26, Harootian teaches the device of claim 20 wherein at least one optical fiber has a different core size from at least one other optical fiber (column 4 lines 8-16).

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US Patent 5303373) and in further view of Basavanhally et al (US Patent 6827500).

Pertaining to claim 21, Harootian describes the device as discussed above. Harootian, however, does not disclose the use of array chosen from the group pf hexagonal arrays, square arrays, and three-nearest neighbor arrays. Basavanhally et al teaches a plurality of optical fibers that are arranged in a hexagonal close packed array

(figure 1; column 2 lines 11-15). The use of the teachings of Basavanhally et al with the device described above by Harootian would have been obvious to a person of ordinary skill in the art, as the hexagonal array described by Basavanhally et al minimizes unused space within the optical fiber bundle.

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US Patent 5303373) and further in view of Smith et al (US Patent 5045100).

As to claim 22, Harootian describes the device as discussed above. However, Harootian does not disclose the use of a glass matrix to contain the fibers. Smith et al discloses the use of a glass matrix for arrangement of optical fibers within a bundle (column 2 lines 51-55; column 1 lines 35-51). To one of ordinary skill in the art, it would have been obvious to couple the teachings of Harootian and Smith et al, for the purpose of uniformity. The use of a glass matrix is beneficial as it provides material continuity between all elements of the optical fiber bundle, ensuring the optical fibers will behave in an appropriate manner. Using dissimilar materials in the construction of the fiber bundle increase the possibility of structural instability and behavior malfunction during the fusing, tapering, and stretching process. Since glass is a common material in fiber construction, it would have been obvious to one skilled in the art to use glass as the material for matrix construction for the reason stated.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US Patent 5,303,373) in view of Smith et al (US Patent 5,045,100) and further in view of Anthon et al (US Patent 6,411,762).

Speaking to claim 24, Harootian and Smith et al describe the device as discussed above. However, neither Harootian nor Smith et al discuss the use of fluorosilicate in the glass matrix designed to restrain fibers. Anthon et al discloses the use of a fluorosilicate glass matrix in the formation of optical fiber bundles (column 13 lines 1-16; figure A). Fluorosilicate offers a low refractive index doping agent, minimizing any light that may be passed from one optical fiber within the bundle to another. For this reason, it would have been obvious to one skilled in the art to use fluorosilicate as the specific glass matrix material.

Response to Arguments

Applicant's arguments with respect to claims 1-19 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments, see page 10 of applicant's remarks, filed 7/5/2005, with respect to the rejection(s)of claim(s) 20 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Harootian (US 5303373). The examiner, upon consideration of the arguments made by the applicant, has withdrawn their rejection, since the rejection was a result of the examiner's false impression that the device, as claimed, required "*the diameter of the*

optical input at the fused end of the given optical fiber is smaller than the diameter of the same optical input at the unfused end." However, upon reexamination of claim 20, the examiner has determined the device as claimed in claim 20 requires "*the diameter of the optical input at the first end of a given fiber (the fused end) is larger then the diameter of the same optical input at the second end of the given fiber (the unfused end).*" It is the examiner's opinion that, as applied previously to claim 20, the Harootian is inappropriate. However, the device of Harootian is described as a "multidirectional device", meaning that it connects to imaging devices A (placed at the non-tapered end) and B (placed at the tapered end), and therefore must be able to communicate signals from A to B, as well as communicate signals from B to A. If one takes this into consideration, along with the fact that the device of Harootian is tapered along its entire length, thus making both sides "*proximate the fused end*," it can be seen that if an optical signal is sent from B (the tapered end) to A (the non-tapered end), then the following limitations, which were the main focus of the applicant's argument of claim 20, are met:

- The optical fibers are fused proximate the first end of the fibers (this is true, and in fact the fibers are fused along the entire length)
- The fused bundle is tapered along a portion of the fused portion of the bundle
- The diameter of the output (A) is larger than the diameter of the input (B)

Applicant's arguments filed 7/5/2005 have been fully considered but they are not persuasive. With respect to the arguments posed for the rejection of claim 21 using Harootian in view of Basavanhally, the examiner disagrees with the arguments made by the applicant. The applicant asserts that since the physical device of Basavanhally may not physically couple with the device as described by Harootian. However, what is important is not the physical structure and size of Basavanhally's device, but what that device can teach about suggestions in the art. Certainly the overall teaching supplied by Basavanhally et al shows the formation of arrays showing a hexagonal shape, and while the actual scaled device of Russell et al may not couple directly with the actual scaled array of Basavanhally et al, the teachings remain applicable, namely showing arrays of differing geometries for optical fiber bundles are possible using arrays. A similar reasoning can be applied to the arguments made by the applicant for claims 22 and 24. The purpose of these additional references is simply to show the intellectual matter at hand was known to those in the art at the time the applicant filed their application. Again, because Harootian described the ends of their fiber as closely packed, this does not disqualify the use of an additional reference such as Smith et al or Anthon. Smith et al simply illustrates that the use of a glass matrix to contain a set of optical fibers was well known within the art before the applicant's application was filed. Whether or not Harootian's actual fiber bundle will fit within the matrix described by Smith et al is irrelevant, but clearly the principle that is taught by Smith et al can be applied to the device of Harootian. Likewise, the teaching of Anthon, namely that fluorosilicate can be used in a glass matrix, can be applied to the device of Harootian in

view of Smith et al, in that the teaching can be used to show how one would use fluorosilicate within a glass matrix, and that it was well known in the art at the time of the applicant's filing.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda S. Peace whose telephone number is (571) 272-8580. The examiner can normally be reached on M-F (8-5).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272- 2344.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rhonda S. Peace
Examiner
Art Unit 2874

John D. Lee
Primary Examiner

Examiner's Affidavit Pursuant to 37 C.F.R. 1.104(d)(2)

The examiner respectfully submits an Affidavit pursuant to 37 C.F.R. 1.104(d)(2) in support of the assertion that "it is inherent that different amounts of stretch result in different degrees of coupling between fibers." The examiner sites Hill et al (US Patent 5150439) which describes how coupling of an optical signal by an optical fiber is affected by the stretching of the fiber, namely as the fiber is stretched the fiber exhibits first an increasing amount of coupling, and then a decreasing amount of coupling or visa versa, depending on the specifics of the fiber (column 3 lines 8-44). The examiner also draws the applicant's attention to Figure 1 of US 5150439, which illustrates the above fact of the relationship between coupling and elongation.

Rhonda S. Peace 7/18/05

Rhonda S. Peace date
Examiner, Art Unit 2874
United States Patent and Trademark Office